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SUBJECT MATTER INDEX OF APPLICATIONS FOR PATENTS.

January 21st to February 20th inclusive.

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⁂ *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

MACHINERY AND CIVILIZATION.

MR. CHARLES C. COFFIN has been giving a series of lectures in the Lowell (Mass.) Institute on our manufacturing industries and the relation of invention to civilization. From the *Boston Advertiser* we make the following extracts from one of these lectures:—

The first need of men in this world is for something to eat; the second is for something to wear. The earliest historical allusion to the manufacture of textile fabrics is the simile in the oldest poem extant—the Book of Job—the comparison of the swiftness of time to the weaver's shuttle. The weaver's shuttle of the East and the loom of the Orient through all the centuries have not changed. Throughout Asia, and even in some sections of Italy and Spain, the spindle of to-day is like that which Penelope deftly twirled when preparing garments for her absent lord. The use of machinery in the manufacture of clothing has been a powerful agency in modern civilization. Out of the multitudinous machines of the present century I select those for spinning and weaving to represent the progress of mechanical art. It is noteworthy that the first movement in free intellectual thought in antagonism to the dogmatism of the Middle Ages and the first mechanism to relieve women from unceasing toil were coincident. During those years in which Martin Luther, Melancthon, and their compeers were awaking the world to a new intellectual and religious life, a German carpenter constructed the spinning wheel, which made its appearance about 1530. The knitting machine was the second invention—the device of a young curate of Nottingham, the Rev. William Lee; and during those months when the Mayflower was crossing the Atlantic, the first stockings knit by the machine were placed on the market.

The lecturer commented upon the fact that the century following Lee's invention rolled away without any invention. Men were giving their attention to other things. The spirit of the age was against invention. The learned were lost in abstractions, were regardless of human needs, utterly ignorant of the resources of nature to alleviate human woe or to lift men to a higher plane of life. another reason why inventions did not come earlier was that all christendom, through the Middle Ages and down to the beginning of the present century, was engaged in war. The conditions were all adverse to scientific research. In 1781, just one hundred years ago, came Watt's first working engine, with a condenser and the steam applied to propel the piston in both directions.

Aside from the very few wind and water mills, the human race at the beginning of the present century was living by its own muscular energy, digging and delving, spinning and weaving, with rude instruments and mechanisms.

The world is more enlightened now, but there are still many people who cannot see how the introduction of a machine which will do the work of many men can be promotive of the well being of the community. Imagine yourselves as standing on the bank of the Merrimac in 1821, with Nathan Appleton, William Appleton, Patrick T. Jackson, Kirk Boott, John W. Boott, Paul Moody, and Nathaniel Bowditch. No sound breaks the stillness, save the rushing of the water over the rock. It is the energy of nature running to waste, and these gentlemen determined to set it to work for their individual welfare. They purchased the surrounding farms and the old canal which other men had constructed for the passage of rafts, set themselves to enlarging it, and in building a dam, not working with their own hand, but summoning the farmers, who came with their oxen to haul rocks. Stonemasons are wanted; and the blacksmith to sharpen their tools. Young men come down from Vermont and New Hampshire to dig the canal. The gentlemen who are pushing the enterprise need bricks. Another class of laborers is called for, Lumber is needed, and sawmills are set to humming. Masons, hodcarriers, mixers of mortar, lime burners, are set to work, with still more oxen, more teamsters and cartmen, besides coopers to make the casks for the lime. An architect plans the manufactory; the carpenters frame it, and a corps of joiners finish it. A millwright calculates the power, sets another corps of men at work constructing the great wheel. The manufacturers of the spinning and carding and weaving machines have regiments hammering and filing brass, steel, and iron. They in turn have set the founders, puddler. and smelters to work. Furnaces send up their lurid flames; vessels are sailing on the ocean to fetch and carry the materials. The miners far down in the earth, the sailor climbing the shroud in mid-ocean, the millwright lost in thought, as he calculates the power of nature's energy, the brickmaker moulding the plastic clay, the joiner plying his plane, the teamster urging his cattle; all have been called from former vocations to aid in building the mills. Why have they come? Because these gentlemen offer them more remunerative wages than they have been receiving.

Let us follow on. The mills are erected, the machines are in place, but human hands are still needed. The gentlemen summon the farmers' sons and daughters by the inducement of better wages. Have the gentlemen thrown any one out of employment? They have changed labour; they have made the spinning wheel and loom of the household useless lumber, not throwing the old-time spinners and weavers out of employment, but transferring them to one in which they can do more for themselves and their fellow-men. You ask, perhaps, what the masons, joiners, and carpenters who built the mill are to do when the mill is completed? Are they not out of employment? The mill is only the beginning. Dwelling houses are needed, stores, shops for the grocer, butcher, baker, joiner, mason, blacksmith—the whole fraternity of trades and occupations. The first mill erected at Lowell was the beginning of a city to-day numbering between 50,000 and 60,000 inhabitants. It will be instructive in this connection to see what labour and capital together will accomplish through the use of the energy of nature, in giving value to raw materials.

The Southern farmer ploughs his lands, casts in the cotton seed. He sells his crop at 12 cents per pound, obtaining a livelihood by agricultural labour. The operative in Lowell by manufacturing it into muslin, may make it worth 80 cents, by more delicate manipulation into lace worth 1 dollar. But before the process could be undertaken by the machinist, the iron manufacturers were called upon to construct the machinery. The ore which the miner dug from the ground, and which he sold for 75 cents, the iron smelter sold for 5 dollars. The machinist makes it worth 100 dollars. If instead of putting it into spindles and wheels, it had been sold to the manuafacturer of fine needles, he would have made it worth 6,800 dollars. The manufacturer of watch springs would have made it worth 200,000 dollars or if he were to use it for pallet arbors it would be worth 2,577,595. Past earnings and present labour together give this increased value to the 75 cents' worth of ore.

Invention renders old things obsolete and so is destructive; but there is a force more destructive than invention, a force that not only drives men from occupation, but upon the instant consigns their costly machines to destruction—a force wielded almost wholly by the female sex—the force of fashion, a power stronger than the combined strength of inventors, manufacturers, and operatives. Not long ago every woman in this audience quite likely regarded a hoop skirt as necessary to make her wardrobe complete. Probably not less than 25,000,000 were manufactured per annum, requiring an outlay of many millions of dollars for complicated machinery, furnaces, and rolling mills for foundation of steel, manufactures for the weaving of tape, employing many thousand operatives; but suddenly the idea gained possession of the female mind that dress would be more graceful and pleasing to the eye without them, and they were upon the instant discarded, bringing about quick destruction to the manufacturers and loss of occupation to the operatives.

Invention is an educator. It begins with thought. The more thought put into his machine by the inventor the higher the intelligence to operate it. Machines has become a distinct profession, requiring high mathematics, physics, and the power of abstract thought. Trade and commerce recognise the new profession by offering it their highest pecuniary rewards. It is the master mechanic, receiving his salary of 15,000 dollars per annum, who is the cheapest employe of some corporations in this country. Fifty years ago, in 1830, the spindles of the world were as follows: United States, 1,000,000; Europe, 2,000,000; Great Britain 8,000,000. To-day the United States has 11,000,000; Europe, 20,000,000; Great Britain,, 40,000,000. In cotton manufacture it is estimated that one man to-day is able to do the work of 1,000 hand labourers, and that the cotton, silk, and woollen industries of to-day would require the labour of every human being if prepared by hand labour.

One hundred years ago, when thread numbered 150 by the standard set up by spinners was considered the utmost degree of fineness possible by English spinners, a pound of cotton spun to such fineness would give a thread 74 miles in length, sufficient to reach from Boston to Concord, N. H. The machinery of to-day spins for useful purposes thread numbered 600—from one pound a thread 196 miles in length. And machinery has been constructed so delicate that a pound of cotton has given a thread reaching 1,061 miles—farther than from Boston to Chicago! The weaver of my boyhood could throw the shuttle perhaps twenty-five times a minute, but not at that rate through the day. Human muscle would break down under such rapid action. In 1850 Compton's loom threw the shuttle fifty times a minute, whereas so great has been the advance of invention, that the loom of to-day is considered a slow moving mechanism if the shuttle does not fly 240 times a minute! "No man can afford to take as a gift to-day a cotton manufactory equipped with the machinery of 1860," was the remark of the late superintendent of the Amoskeag Mills. "We are breaking up the machinery of those days for old iron."

In some departments of cotton manufacture a man with the present machines will do eight times the amount of work which he could accomplish in 1860. In the manufacture of coarse cloth an operative with ten machines does twice the work which he could accomplish with thirteen machines before the war. There never was a period so fruitful in discovery, so fertile in invention as the present, and the reason is manifest. The first discoverers and inventors groped in the dark. They were ignorant of nature's laws, They did not know what force was. They had a limited comprehension of what the simple mechanical powers were. There was little accumulated wealth of research.

In contrast, the mechanic of to-day has all the discoveries, the experiments, the ascertained facts, mathematics of machinery, the laws of force at his command. He inherits the scientific wealth of all the past and makes it his capital. Instead of gazing as it were, upon old mines worked out, he beholds mountain ranges filled with golden ore, and engages in his work with the stimulus of the needs of the human race, and the ever increasing wants of an advancing civilization.

JAMES TENNANT.

The death of Prof. James Tennant, F.G.S., of King's College, London, will be regretted by a large number of friends and acquaintances throughout the scientific world. His celebrity as a mineralogist was universal, and his special acquaintance with gems secured him the honour of re-cutting the famous Koh-i-noor diamond for her Majesty, and the permanent appointment of Mineralogist to the Queen. He died on the evening of Feb. 23, in much suffering, from bronchitis, having completed his 73rd year on Feb. 8. To him many of our most noted geologists and mineralogists are inebted for the sound practical knowledge of the sciences which has secured them their present position, and his work will long be referred to for information. He compiled a Catalogue of Fossils found in the British Isles; Art Gems and Precious Stones; a Description of the Imperial State Crown preserved in the Jewel House of the Tower of London; Iceland Spars; and a Stratigraphical List of British Fossils, with remarks on their characters and localities. He was likewise joint compilers with Profs. Ansted and Mitchell of the Treatise on Geology, Mineralogy, and Crystallography, published in 1857 in Orr's Circle of the Sciences. He was one of the few who really teach what they profess, and his place will not be easily supplied. His funeral, which took place on February 28, was attended by a large number of scientific friends, Liverymen of the Turners Company, and others. Baroness Burdett-Coutts has expressed the wish to place a suitable memorial stone upon his grave.

The Patent Law Question at the British Horological Institute. — On Monday, March 14, at Seven o'clock, Mr. John Standfield, C.E., will deliver a lecture on "Cheap Patents and Prosperity," when Mr. Samuel Morley, M.P., is announced to preside.

THE TIDE-GAUGE, TIDAL HARMONIC ANALYSER, AND TIDE-PREDICTER.

By Sir William Thomson,
LL.D., F.R.SS. L. & E., M. Inst. C.E.

At a meeting of the Institution of Civil Engineers on March 1st, the Paper read was as above.

The author stated that the self-registering Tide-Gauge was a well-known instrument for automatically recording the height of the sea-level, at every instant, above or below some assumed datum line. The first essential of the instrument was a floater, which rose and fell with the floater. The practical annulment of wave disturbance, so that the floater at each instant might be nearly enough in the position corresponding to the mean of the water-level for several minutes, was an important detail. The next thing was mechanism to cause a marking pencil to move in a straight line in simple, but much reduced, proportion to the motion of the floater. The instrument was completed by clockwork, carrying paper with a uniform motion perpendicularly across the line of motion of the pencil, with proper arrangements to cause the pencil to press with sufficient force on the paper to make it mark.

The tide-gauge described differed from other tide-gauges only in certain dynamical and geometrical details, designed for giving, in more convenient form, results of greater or of better assured accuracy; with a smaller floater, and finer and smaller, but not less hardy, mechanism. The leading idea for the design of every machine ought to be the work done by it. In the tide-gauge the work done was the moving of the pencil across the paper, subject to the pressure required to produce the mark.

The author's first object, therefore, was to minimise the friction of the pencil carriage. Considerable progress had been made towards attaining this object in the ink-marker of the South Kensington Tide-Predicter, and in the author's first tide-gauges exactly the same geometrical slide was used as in this instrument. In it the motion of the marker was vertical, the axis of the paper cylinder being vertical, instead of both being horizontal, as had been the case in all previous tide-gauges. The couple, constituted by gravity downwards through its centre of gravity and the upward pull of the bearing-wire, was balanced by the reaction of the paper on the marker, in a horizontal line, near the bottom of the mass, and an equilibrating horizontal force, constituting the reaction of the plane back of a fixed guiding frame against a round-ended pin fixed to the back of the marker near the top.

Thus the equilibrium of the marker was a simple and direct application of Poinsot's theory of the equilibrium of couples. The five sliding points of a geometrical slide were systematically provided for the marker, so that, while its motion was perfectly steady, it was as little opposed by friction as might be. An improvement upon this marker, designed for the second of three tide-gauges, being erected on the Clyde by the Trustees of the Clyde Navigation, was also described. In this the pressures of three of the five sliding points were annulled; and the sole friction against the motion of the marker was the friction of the pencil upon the paper. The author's tide-gauges had hitherto all been provided with the means of using continuously a band of paper long enough to allow the curve to be traced on it simply and without break, through the whole length required for a year. Thus, if it were not desired to take away any tracing of the machine for examination or reduction through the course of a year, no other work was necessary than to wind the clock once a week or once a fortnight, and to put in a fresh lead for the pencil as often as one was needed. The two cylinders for the paper supply and for the haul-off might, however, be omitted or left unused, in any case in which it was desired to mark a week's or a fortnight's curves on a single twenty-fours' length of paper, as had been hitherto usually done in other tide-gauges. This involved the trouble of taking off a paper of curves and putting on a fresh piece of blank paper once a week or once a fortnight, and had the considerable disadvantage of giving a more confused appearance, and involving some practical difficulty and inconvenience in picking out the right curve for a particular day. On the other hand, the old plan had the great advantage of using less paper, and giving the results in a more compact form, and also some advantage in respect to facility of application to the Tidal Harmonic Analyser. Specimens of both the old and new plans were exhibited.

The object of the Tidal Harmonic Analyser was to substitute brass for brain in the great mechanical labour of calculating the elementary constituents of the whole tidal rise and fall, according to the harmonic analysis inaugurated for the tides by a Committee of the British Association appointed in 1867, and carried on till 1876, and recently adopted by the Government of India. The machine consisted of an application of Prof. James Thomson's Disk-Globe and Cylinder-Integrator to the evaluation of the integrals required for the harmonic analysis. The principle of the machine and the essential details were fully described in papers communicated by Professor James Thomson and the Author to the Royal Society in 1876 and 1878.

The author described the machine, which was illustrated by detailed drawings and photographs, and he showed the working of it by a model, having five Disk-Globe-and-Cylinders, which had served as model for the meteorological harmonic analyser, constructed for the Meteorological Committee, and now regularly at work at their office, under the superintendence of Mr. R. H. Scott. This instrument also served to determine, from the deviation curve, the celebrated "A B C D E" of the "Admiralty Compass Manual" for the deviation of the compass in an iron ship.

The Tide-Predicter performed the mechanical work of calculating the sum of the heights (positive or negative) above the mean level, due to the several simple harmonic constituents of the whole tidal rise and fall, determined by the harmonic analysis from observations from any particular Port. The object was to predict for the same Port for future years, not merely the times of high and low water, but the position of the water level at any instant of any day of the year. The mode of combining the several constituents adopted by the Author originated in a suggestion made by Mr. Tower in August, 1872, who said—"Why not use Wheatstone's plan of the chain passing round a number of pulleys, as in his alphabetic telegraph instrument?" This proved the very thing wanted. The plan was completed, with a fine steel hair-spring, or wire, instead of the chain, which was obviously too frictional for the tide-predicter. The general object of the tide-predicter and some of the details of the first instrument—which was exhibited by permission of the Science and Art Department, under whose care it had been permanently placed by the British Association—were described in the Catalogue of the South Kensington Loan Exhibition of 1876. A second instrument, including twenty tidal constituents, instead of the ten in the original instrument, and with greatly improved arithmetical exactness in respect of the several shafts, and on a much larger scale than that of the first instrument, had been constructed for the Indian Government by Mr. Légé, under the superintendence of Mr. Edward Roberts, and in accordance with the Author's advice. In it, as in the British Association instrument, the number of teeth in the toothed wheels was calculated by Mr. Roberts. This instrument had already done excellent work in predicting the tides for the Indian Ports, as given in the Volume of Tide Tables for the year 1881, prepared by Captain Baird, R.E., assisted by Mr. Roberts, who had had charge of the instrument in London. The author had nearly completed a third instrument with great simplifications of mechanism, one important result of which was that it was adapted to run off a year's tide curve in twenty-four minutes, instead of four hours, required by each of the first two instruments. Detailed drawings of this instrument, so far as at present completed, were exhibited.

ECONOMY OF FUEL AND PREVENTION OF SMOKE.

In a lecture recently delivered at Glasgow, Dr. Siemens demonstrated the advantages to be derived from gaseous fuel in preference to coal for warming the rooms of our dwellings. By the conversion of an ordinary fire-grate into one capable of consuming gas and coke he showed a saving of one penny per day, gaining at the same time a large increase of heat. More recently Mr. Hay, of the Royal Arsenal, Woolwich, has been experimenting with Dr. Siemens' arrangement, and found the use of coal in his case very much the cheapest; and it is evident that the margin of saving obtained by Dr. Siemens is not half enough to be reliable in ordinary use, Gas, except under peculiar conditions, is too costly a fuel to be used in fire-grates where a large proportion of the heat of necessity goes up the chimney.

When we come to other purposes, such as ordinary domestic cooking by gas, the conditions are altered, and some both curious and interesting experiments have been made by Mr. A. Percy Smith, of the Temple Observatory, Rugby, who recently has for eight consecutive days measured the quantity of gas consumed in his house for cooking and for lighting purposes. His measurements show conclusively that little addition is made to the gas bill of an average household by its use for cooking. In this case the gas used was the ordinary town's supply, at 3s. 5d. per 1,000, and the apparatus consisted of the oven and boilers made by Mr. Thomas Fletcher, of Warrington. The result showed that while, for illumination, 809 cubic feet of gas has been used, costing 2s. 11¼d., the preparation of food had required only 200ft., costing 8d. The daily average was, for lighting, 4½d. per day; for cooking, one penny per day. An average kitchen fire of the ordinary open pattern will consume, coal to the value of about 2s. per week, and of the fuel used 10lb. to 20lb. will go up the chimney as smoke and dust.

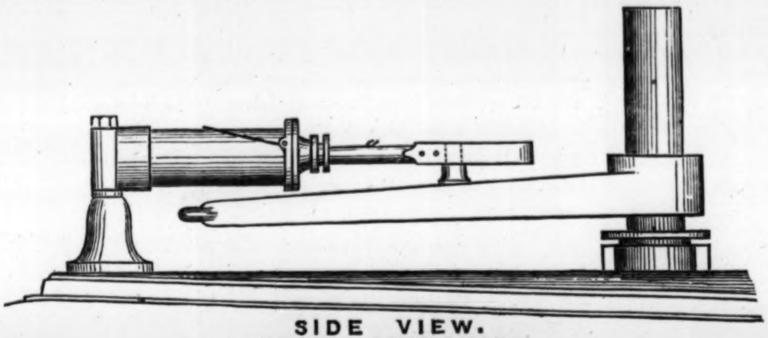
The economy of gas as a means of cooking is therefore clearly established, It must be borne in mind, however, that the actual work done by the Fletcher Burner, as compared with the ordinary Bunsen, has been tested by R. Briggs, C.E., and found to be as 450 to 244, and thus the cost of a cooking apparatus fitted with the usual burners would be nearly double that of the experiment referred to.—*Design and Work.*

Mr. William Winegar, of Chambersburg Ill., has patented an invention which *avoids the necessity of special supports for the wheels of grain drills*, and provides that each wheel shall maintain a constant position relative to the bottom of its tooth for all changes in the position of the tooth by an automatic adjustment. He combines with the hollow drill tooth a pronged wheel attached directly to the side of the tooth and carried by the latter, which clears the drill teeth of straw or other obstructions instead of arranging such wheel between the teeth of the drill as has hitherto been done.

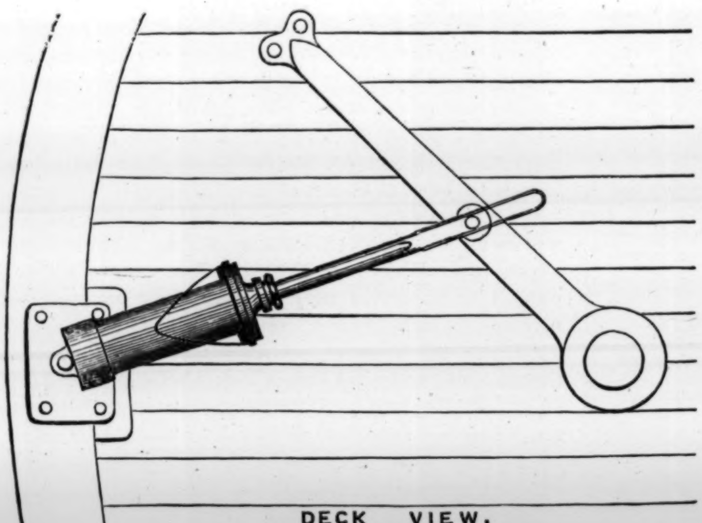
DAVIES'S PATENT SAFETY STEERING APPARATUS.

THIS new mechanical steersman consists of an oscillating steel buffer, pivoted and mounted on deck, and arranged so as to exert its power direct on the tiller.

It can be disconnected by turning over a check link, which will engage itself into a shouldered hook in the connecting rod, and so prevent the expansion of the spring after the tiller has passed "steady," and the long strap on end of the rod will cause the buffer to follow the tiller to all points; so that when the helm comes amidships it can as easily be connected by turning back the check link.



SIDE VIEW.
HELM AMIDSHIPS.



DECK VIEW.
HELM HARD OVER

It will be observed that, when the tiller has just cleared keel-line, there will be a maximum thrust of spring on a minimum leverage; thence to "hardover" there will be a diminishing thrust, but an increasing leverage.

The chief object of this invention is to supply auxiliary power to a ship's helm in order to ensure quick steering when necessary, and so reduce the chances of collision. It has been designed so as to work automatically with any kind of steering gear—from the plain hand tiller to the most approved wheel purchase—and also to make a vessel partially "self-steering."

It is self-acting, and silent in all its movements.

Cost of maintenance trifling; only two bearings to lubricate.

Extremely simple in construction; derangement improbable.

Should the vessel "ship a sea" the water will not affect its working.

In practice it has been highly commended for its utility in heavy weather, kicking and vibration of the rudder being reduced to a minimum, and steadiment given to the entire helm.

It is also applicable with advantage to vessels having steam steering gear to prevent vibration of the rudder, and, where strict economy in fuel is important, steam need only be used for going in and out of port or at other times when very quick steering becomes essential; and for very large steamers it recommends itself as a useful motive power to work in conjunction with the usual spare-hand gear in case of an accident to the steam steering machinery.

This apparatus, which is applicable to sailing and steam vessels without regard to size (in work as well as in course of being built), having been in successful operation under sail and steam over a distance of 80,000 miles, is submitted to shipowners as the best means of increasing the efficiency of a ship's rudder gear—as regards easier and more rapid steering, as well as considerably lessening the wear and tear of rudder-pins, bushes, and the helm purchase, especially the "screws." The inventor is J. Davies, 38, Jolliffe Street, Liverpool.

TEMPORARY WORKS AND PLANT AT PORTSMOUTH DOCKYARD.

By C. H. MEYER, Assoc. M. Inst. C.E.

IN this paper, which was read at a meeting of the Institution of Civil Engineers, Mr. Abernethy, F.R.S.E., President in the Chair, after briefly describing some of the means used in carrying out these great works, which were begun in 1867, and practically finished in 1876, the author alluded to the peculiarities of the site, and to the method adopted to reclaim 75 acres of the tidal portion of the harbour by cofferdams. These comprised 3,100 lineal feet of shallow dams, 300 lineal feet of outer or main dams, and 200 lineal feet of special dams across channels, which were closed by panels, the details in all cases being given. Mention was then made of the reasons that had led to the extensive use of steam power and mechanical appliances in the carrying out of the works, on which was brought together perhaps a larger amount of such plant than probably had previously been used on any similar work. Some of these appliances, including an attempt at dredging from staging, which, however, was not altogether a success, and the use of various travellers for performing heavy work, and of different forms of steam piling engines, were described in detail.

As ordinary roads and railways laid upon the ground were in most cases inapplicable, timber viaducts for double lines of way had generally to be adopted within the area to be occupied by the intended works. A viaduct of about 3,000 feet in length for a double line had also to be constructed to connect the works with the site chosen for the deposit of the surplus excavated material. This latter work necessitated the crossing of a navigable channel, named Fountain Lake, in Portsmouth Harbour. In order not to impede the water traffic, a swing bridge became necessary. A bridge for this purpose was specially designed by the late Mr. E. P. Smith and Mr. Ernest Latham, its requirements being two openings of 50 feet each in the clear for the waterway, and handiness and rapidity in action when in use. This was obtained in a most satisfactory manner; the bridge, however, was only for a single line of way. It was supplied with automatic locking gear, so that the moment it was swung into position it was ready without further delay for the passage of trains. With regard to the timber viaducts, the author pointed out what experience had shown to be their capability as to endurance, and under what conditionss they failed. He then described the gantries, or roadways, for the heavy steam travellers, which were so much used on the works, and under what conditions they had been found sufficient for their purpose, and the contrary.

The arrangements for keeping the works free from water, and the freedom of the site from water, were next touched upon. Under ordinary circumstances, one Murray's chain pump, lifting the water about 50 feet, was generally sufficient to keep the area within the shallow dam (the drainage area of which was about 103 acres) clear. Mention was also made of an experimental boring, sunk to investigate the condition of the beds lying below those actually excavated in the ordinary course of the work, both with a view to obtain an insight as to the necessary foundations, and the determination of the exact geological position of the beds exposed.

The author then described the means specially adopted in excavating for, and in constructing wells in that part of the work outside the limit of the area first reclaimed, where, on account of the depth of the mud through which the foundation had to be reached, the work was treated in an entirely different manner from the rest. It was found unadvisable, if not impossible, to do without whole timber sheet-piling through the entire depth of the mud, and to work within the trenches so formed. The outer cofferdam, close to which this part of the work was situated, was exposed to considerable risk, being alongside Fountain Lake. Diagrams illustrating this part of the work were shown, as well as others, exhibiting features both in the structure of the permanent works and in the means taken to carry them out.

The paper concluded with a notice of an entrance of 94 feet clear opening, which had to be constructed to afford direct communication with the harbour. Deep mud and the vicinity of the cofferdam rendered this a work of difficulty. It was not thought prudent to excavate the entire width at once; the outer half was, therefore, first completed, and a curved brick wall or dam, built in segments to render its removal easy, was carried across the opening, thus supporting the cofferdam and clearing the ground for the construction of the second half.

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AND

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SESSION 1880—1881.

Members' Meetings at 8 p.m. on Thursdays, March 10th and 24th; April 7th and 28th; May 12th and 26th; and June 9th.

Annual General Meeting, Thursday, May 26th, at 4 p.m., unless otherwise arranged.

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F. W. Campin, Sec.

Proceedings of the Institute.

At the Executive Council Meeting held during the past month there was an important discussion on the Patent Law Question. As it is to be continued we reserve our report. At the Members' Meeting there was an exposition of several inventions.

Monthly Notices.

Tidal Telegraphism.—Mr. Alexander Adams, of the Post Office Telegraph Department, is said to have proved the existence of tidal movements in the electricity of the telegraph wires. He communicated this discovery to the Society of Telegraph Engineers last month.

Micro-Telephone.—Father Deuza, the Italian Astronomer, has been making some experiments with the micro-telephone on the line of railway from Turin to Lanzo, which is about twenty miles long. The voice was distinct and clear, and so strong that it was heard all over the room at Lanzo. "Conversation between the two interlocutors was as animated as if they had been in the same place.

A "*Gold Institute*" is about to be established with three departments, practical, chemical, and mechanical. Mr. Lock has offered his books on metallurgy and his illustrative specimens to the Institute.

Phosphorescent Paint.—It is reported from Turin that the phosphorescent paint may be mixed with printing ink, by which the letters become luminous in the dark. It is said that a new daily paper is to be published at Turin, in which the luminous ink is to be employed.

The Paris Exhibition of Electricity.—A circular has been issued by the French General Commission for the forthcoming exhibition of electricity to be held in Paris, relating to the consignment of exhibits. Arrangements have been made with the various French railway companies by which goods will be consigned to Paris at one-half the usual rates; or, rather, the ordinary tariffs will be charged for forwarding packages for the exhibition, but they will be returned gratuitously. The exhibition precints will constitute a customs depot to which exhibits can be consigned without inspection either on the frontier or on their arrival in Paris, and they can be also returned free of duty. On goods, however, subject to taxation, and remaining in France, the ordinary duty will be levied. Such exhibits, as well as those the importation of which is prohibited in France, will, under a special law to be passed, be subjected only to such duty as apply to the most favoured country in this respect. The German Government has nominated M. Elsasser, private state councillor, as the German Commission, while the Count Oultremont and Dr H. Militzer will represent Belgium and Austria respectively. Applications for space will be received until March 31, and goods may be deposited after July 1 next.

Action of Certain Chlorides on Aniline Colours.—M. Girard and J. A. Pabst have introduced into tubes the chlorides of silicon, $SiCl_4$, of carbon, CCl_4, and of tin, $SnCl_4$, with four times their respective volumes of chemically pure aniline, which with arsenic acid yielded not more than 1-5000th of its weight of mauvaniline without a trace of red or yellow. The tubes were sealed and heated for twelve hours to 225° to 230°. No pressure was observed when they were opened. The carbon perchloride had produced triphenyl-guanidine, rosaniline, and a brown matter offering all the reactions of Bismarck brown, which is well known to be produced by the action of aniline hydrochlorate upon rosaniline. Tin perchloride yielded violaniline and mauvaniline in small quantity, a large proportion of rosaniline or para-rosaniline; also Bismarck brown, and a trace of a green matter. Silicon chloride yielded violaniline, and especially triphenylene diamine blue, as well as a trace of mauvaniline. Antimony perchloride, heated with aniline to 125°, reacted very violently, forming violaniline, a small quantity of triphenylene diamine blue, and a certain quantity of a blue matter, analogous to that produced by the action of hydrochloric acid upon the azoic compounds. Thus, notwithstanding the parallelism of their properties and constitutions, carbon chloride yields rosaniline; silicon chloride, violaniline; and tin chloride, both these colouring matters.

The Banishment of Bees.—At the petition of the Parisian refiners of beet-root sugar, the Prefect of the Seine has proscribed bees in the neighbournood of the city. A single refiner in the 13th arrondissement estimates his losses at 25,000 francs.—*Moniteur Scientifique, Quesneville.*

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review
INCORPORATING THE "JOURNAL OF THE INVENTORS' INSTITUTE."

MARCH, 1881.

OUR LAW COURTS AND PROPERTY IN INVENTION.

THE dilatory proceedings and excessive costs attending law process have lately been the object of considerable attention, the public press being much taken up with the consideration of these important points.

Now Courts of Law and their doings are by no means matters of indifference to Inventors and Patentees, who are, perhaps, more interested in law proceedings than any other class of people, seeing that it is a well known notion, not altogether ill-founded, that taking out a Patent for an Invention is like buying a lawsuit. Literary men and holders of copyright are almost equally interested.

The great point that seems to trouble the minds of most persons who have made public their ideas as to the needed reforms in legal procedure, has been based upon the notion that there can be no efficient adjudication between contending litigants, except by the aid of Her Majesty's Supreme Court of Judicature. Now to our mind this is a highly erroneous notion, for it is by no means a necessary thing to invoke the aid of such a high and mighty judicature for the settlement of at least one half of the cases placed on the lists of the Queen's Bench or Chancery. A good County Court Judge (with, in some cases possibly the assistance of "Expert" assessors), would efficiently decide them; though we are well aware this would be pooh! poohed! by the legal profession—as to which we may remark that we have been much surprised to find our contemporary the *Times* giving up much space and consideration to the views and wishes on this subject of the legal profession, ignoring, so to speak, the public and client's view of the matter.

We certainly consider that the system of judicature existing in France and many other countries where Courts of First Instance are scattered over the land like our County Courts, to which civil litigation of all and any kind and amount may resort, is far preferable to our system of preventing the use of these Courts except for small debts, or cases falling within a very limited range of legal contentions; for it is certain that a large majority of law cases in which two decent persons are concerned, could be settled off hand by the interposition of a learned and reliable person; and carrying up the matter to the House of Lords seldom gives any one any greater regard for the propriety and justice of the decision arrived at.

In thus speaking in favour of the general adoption of County Courtism, we are aware that system requires considerable modifications and improvements, and that still keeping to the advantage of clients rather than lawyers we consider the absurd rule which obliges a County Court litigant to fee both a solicitor and a barrister, if he desires the aid of the latter, should be abolished, seeing there is no work required to be done in ordinary cases in a County Court which is really within the proper province of the solicitor, an advocate and adviser being there all that can be useful.

The above statements may appear to many to have very little to do with the interests of Inventors and Patentees, but in this they will be much mistaken; for to Inventors of small means (and the general run of Inventors must be thus characterised), the enforcement of their claims as Patentees in a cheap and speedy matter is of the first importance. Many of our Inventors have been brought to ruin from the want of this. May we hope that in the next measure of Legal and Patent Reform this advantage for them may be secured.

In addition to the news above enunciated it may be stated that, as far as the special benefit of Inventors and Patentees is concerned, it would probably be more to their purpose if Tribunals of Commerce as now in course of initiation by some of our Chambers of Commerce were established, with a special Patent Law Section acting in conjunction with a Reformed Patent Office.

Proceedings of Societies.

ROYAL SOCIETY.

Feb. 3.—The President in the chair.—The Right Hon. M. E. Grant-Duff was elected a Fellow.—The following papers were read: "On the Cause of the Striation of Voluntary Muscular Fibre," by Mr. J. B. Haycraft.—"Description of some Remains of the Gigantic Land-Lizard (*Megalania Prisca*, Owen) from Australia," Part III., by Prof. Owen. "On a Method of destroying the Effects of Slight Errors of Adjustment which may vitiate the Results of Experiments of Changes of Refrangibility due to Relative motions in the Line of Sight," by Mr. E. J. Stone.—"On an Improved Bimodular Method of computing Natural and Tabular Logarithms and Anti-Logarithms to 12 or 16 Places with very Brief Tables." "On the Potential Radix as a Means of calculating Logarithms to any required Number of Decimal Places, with a Summary of all preceding Methods Chronologically Arranged" and "On the Influence of Temperature on the Musical Pitch of Harmonium Reeds," by Mr. A. J. Ellis.

SOCIETY OF ANTIQUARIES.

Feb. 3.—H. Reeve, Esq., V.P., in the chair. —The whole of the meeting was taken up by a carefully prepared account, by Mr. W. C. Borlase, of his extensive excavations in Cornish barrows. Mr. Borlase bears the perilous honour of a great name in the annals of archæology, but his paper showed he was no unworthy descendant of the famous historian of Cornwall. The paper was chiefly valuable from the minute and detailed record it gave of the circumstances of each particular "find," and from the sobriety with which conclusions were drawn.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

Feb. 2.—T. Morgan, Esq., in the chair.—The discovery of a portion of a Roman sepulchral slab at South Shields was reported by Mr. R. Blair. It represents a moulded pediment with heads in high relief, and is similar in workmanship to the celebrated slab with the Palmyrene inscription found in the same locality, the site of the cemetery of the Roman station.—Mr. De Gray Birch read a description by Admiral Wood of another Roman tomb at Yllora, Spain, on the estate of the Duke of Wellington (see *Athen.* No. 2773), and of a massive gold ring with a dolphin cut on a blue stone found in a large coffin at the same place.—Miss Brocklehurst and Miss Booth sent for exhibition a series of drawings of the new grange tumulus.—Mr. G. R. Wright described a memorial stone supposed to be of a chieftain of the Arthurian period. The slab was found at Yarrow, and a cast of it is in the Museum of the Society of Antiquaries of Scotland.—Mr. L. Brock communicated the discovery of Roman architectural work on the site of a bastion of London Wall recently met with in Houndsditch. These consist of a well-wrought base of a column and part of the shaft of a diapered column of bluestone.—Mr. Watkins produced elaborate drawings of the Roman City wall, Houndsditch, recently removed for a length of about 70ft. The walling, which was 8ft. thick, was faced with squared stone, with bands of red tiles and a chamfered plinth of dark ironstone, and of great strength and regularity. —Mr. Grover described a remarkable find of Roman remains on the premises of Messrs. Tyler, Warwick Square (see *Athen.* No. 2780). —The first paper was by Mr. Butcher, descriptive of the progress of the exploration of the Roman villa at Bromham made by Mr. Cunnington and himself.—The second paper was by Dr. Phené, "On some recent Excavations made into the Mounds of the Troad." The results were reported by the lecturer in detail.

ARCHÆOLOGICAL INSTITUTE.

Feb. 3.—J. Hilton, Esq., in the chair.—Mr. F. C. J. Spurrell made some remarks on a collection of implements of successive ages from the river-drift, cave or rock shelter, and neolithic times, lent by Sir J. Lubbock and Mr. B. Harrison, and found at Oldbury, Ightham, Kent.—Mr. J. P. Harrison read a paper "On Incised Outlines of Fish and other Early Marks in the Crypt of Gloucester Cathedral."—Mr. Burges, the Rev. E. M. Blakiston, and others took part in the discussion which followed, from which it would appear that masons at all periods, as at the present time, used distinctive marks to indicate the work for which they were to be paid. But such workmen's marks seem to be totally different things from some of the figures to which Mr. Harrison called attention, and of which the real significance is by no means clear at present.—Mr. J. G. Waller offered some observations on the well-known brass of John de Northwode and Joan his wife from the church of Minster, Isle of Sheppey.—Mr. W. Huyshe sent some notes upon two remarkable helms, one from Petworth Church, exhibited by permission of Lord Leconfield, a tilting helm of the early part of the sixteenth century, and probably an unfinished piece of armourers' work, bought on an emergency for the funeral pageant of Sir J. Dawtry, over whose tomb it hangs, and who died in 1527. The second helm, exhibited by the Rev. W. Fiennes Trotman, has hung for many years in Wimborne Minster, over the tomb of John Beaufort, Duke of Somerset, who died in 1444. Mr. Huyshe was, however, able to show that the helm belongs to a time between 1480 and 1520, and that it is of the kind used for the tourney and for fighting on foot at the barriers. Its original possessor is not known. The "bellows-vizor" is a noticeable feature in this fine example of armourers' work.—Mr. Burges gave a technical description of a once very beautiful peaked helmet, with a camail bearing the Constantinople armoury mark, and forming a portion of the armour that came to this country from Turkey about forty years ago. Mr. E. Peacock exhibited a bronze mortar, bearing an obscure inscription, and a pestle, and contributed some notes on mortars in general.—Mrs. Lowell sent a globe of crystal of large size and great beauty; and Mr. H. R. H. Gosselin exhibited a pair of silver-mounted and inlaid pistols, *temp.* Queen Anne, by a celebrated Scotch maker at Doune.—It was announced that the annual meeting of the Institute will be held at the end of July at Bedford.

LINNEAN SOCIETY.

Feb. 3.—R. McLachlan, Esq., in the chair. —Lieut.-Col. A. A. Davidson was elected a Fellow.—A paper by Mr. G. Bentham was read, "Notes on Cyperaceæ, with special reference to Lestiboudois's Essai on Beauvois's Genera."—"Observations on the Life Histories of Gamasinæ" was a paper read by Mr. A. D. Michael. He avers that the remarkable power of darting each mandible separately with speed and accuracy of aim far in advance of the body, the powerful retractile muscles attached to these mandibles, the organization of the remainder of the mouth, the extreme swiftness of the creatures, the use of the front legs as tactile organs only, and not for the purposes of locomotion, and the ample supply of tactile hairs in front only, seem in all to fit the animals for a predatory life. They point to habits similar to those of Cheyletus and Trombidium rather than to those of the true vegetable feeders, such as the Oribatidæ and Tetranychii. He supports M. Mégnin as to many so-called species being but immature stages; he thinks division of dorsal plate a weak character for classification, their alteration in size and form being related to development; he differs from Mégnin as to *G. coleoptratorum* being the nymph of *G. crassipes*; and he has not observed an inert stage before transformations or skin-casting.—Two papers on the coffee-leaf disease were read, one by Mr. W. Bidie, the other by Dr. M. C. Cooke. In the former the author refers to the Coorg district in India, where the disease was first noticed four years ago, and believed to have been introduced from Ceylon by way of Mysore. It seems worst in impoverished exposed lands and least where there is shade and rich soil. A small red insect has been observed, but what its relations to the disease are is undetermined. A system of "renovation-pitting" has been successfully tried; pits are dug at intervals, wherein after judicious pruning all affected leaves are buried, which precaution seems to check the spread of the disease, especially among trees of Coorg origin. In the second paper Dr. Cooke describes and summarizes the data extant at present concerning the progress of coffee disease in South America, where plantations in Venezuela, Costa Rica, Bogota, Caracas, and Jamaica have been affected. He is of opinion that there the disease is a complicated one, being himself as yet unprepared to affirm that the Septoria, the Sphærella, or the Stilbum (three so-called different kinds of fungi), or all together, is the true cause of the disease. At the same time he thinks it possible that none of these forms of fungus is autonomous, and that all may be related to each other as forms or conditions of the same fungus, of which Sphærella is the highest and most perfect manifestation.

ZOOLOGICAL SOCIETY.

Feb. 1.—Prof. W. H. Flower, President, in the chair.—Papers and letters were read by Mr. F. M. Balfour, on the evolution of the placenta, and on the possibility of employing the characters of this organ in the classification of the mammals;—by Mr. Sclater, on some birds collected by Mr. E. F. im Thurn in British Guiana, amongst which was an example of a new species of Agelæus, proposed to be called *A. im-Thurnii*, after its discoverer;—by Mr. W. T. Blanford, on a collection of reptiles and frogs made at Singapore by Dr. W. B. Dennys; in this collection were two new species of Ophidians, which were named respectively *Cylindrophis lineatus* and *Simotes Dennysi*, and two new frogs, which the author proposed to call *Rana laticeps* and *Rhacophorus Dennysi*;—by Mr. A. D. Bartlett, on a peculiar habit of the darter (*Plotus anhinga*) in casting up parts of the epithelial lining of its stomach, —from Mr. A. H. Cocks, on the breeding of otters;—by the late Mr. A. O'Shaughnessy, on a large collection of lizards made by Mr. C. Buckley in Ecuador; twenty-seven species were mentioned, ten of which were new;—by Mr. G. A. Boulenger, on a new species of Enyalius in the Brussels Museum, from Ecuador, which he proposed to name *Enyalius O'Shaughnessyi*;—and by Lieut.-Col. H. H. Godwin-Austen, on the land shells of the species of Cyclostomaceæ collected on the island of Socotra by Prof. L. B. Balfour.

CHEMICAL SOCIETY.

Feb. 3.—Dr. Gladstone, V.P., in the chair. —It was announced that a ballot for the election of Fellows would take place at the next meeting.—The following papers were read: "On the Estimation of Organic Carbon in Air," by Drs. Dupré and Hake.—"On the Action of the Copper-zinc Couple upon Nitrates, and the Estimation of Nitric Acid in Water Analysis," by Mr. M. W. Williams. Some strips of clean zinc foil are placed in a wide-mouthed stoppered bottle, and covered with a 3 per cent. solution of copper sulphate; when the zinc has acquired a sufficient coating of copper, the solution is poured off, and the copper-zinc couple washed. The water to be analyzed is then poured on the couple, and allowed to remain for some hours at 24° C., after the addition of a little pure sodium chloride. The nitrates are thus completely converted into ammonia, which is estimated by Nesslerizing:—"On the Position taken by the Nitro Group on nitrating the Dibromotoluenes," and "On some of the various Derivatives of Toluene and the Toluidines," by Messrs. R. Nevile and A. Winther.

INSTITUTION OF CIVIL ENGINEERS.

FEB. 8.—Mr. Abernethy, President, in the chair.—A paper "On the Temporary Works and Plant at the Portsmouth Dockyard Extension," by Mr. C. H. Meyer, was read.

ROYAL INSTITUTION.

FEB. 7.—Dr. W. Bowman, V.P., in the chair—Miss A. F. Dubort, Mrs. C. Gabriel, Mrs. E. F. Hight, Lieut.-Col. L. W. Longstaff, Dr. E. W. Lane, Messrs. R. H. Few, T. Gabriel, J. H. Knight, W. F. Larkins, and A. Vacher were elected Members.

SOCIETY OF ARTS.

FEB. 7.—The opening lecture of a course of three lectures "On Watchmaking" was given by Mr. E. Rigg.

FEB. 9.—Sir P. C. Owen in the chair.—A paper "On the Present Condition of the Art of Wood Carving in England" was read by Mr. J. H. Pollen. The paper was illustrated by specimens of wood carving, lent for the purpose by the recently established National School of Art Wood Carving and by others.

ANTHROPOLOGICAL SOCIETY.

JAN. 25.—Anniversary Meeting.—Dr. E. H. Tylor, F.R.S., President, in the chair.—Dr. E. B. Tylor, the retiring President, gave the annual address. He described the excellent arrangements in the United States for supplying Indian agents, missionaries, and others in contact with native tribes, with manuals to guide them in collecting information as to laws, customs, languages, religion, &c., the very memory of which will die out with the present generation of Indians. He contrasted the active intelligence of the United States in this with the fact that the Dominion of Canada, though kindly and wise in their practical management of the Indians, do not seem alive to the value of the scientific knowledge which is being lost among them for want of a little cost and trouble in collecting it. Dr. Tylor also spoke of Prof. Flower's study of the mountaineers of Fiji, the Kai Colo, a race who have the narrowest skulls of all mankind. The public have not yet become aware of the value of minute measurement of skull dimensions, but Prof. Flower has clearly shown in it a means of bringing the study of races under arithmetical calculation, a step which will do much to bring anthropology among the exact sciences.—The new President is Major-General Pitt Rivers.

ARISTOTELIAN SOCIETY.

JAN. 31.—S. H. Hodgson, Esq., President, in the chair.—Mr. S. Oliver read a paper "On Leibnitz," which was followed by a discussion.

Mr. Francis N. Cummings, of Porterville, N. Y., has patented an improved *cheese curd sifter and picker* made so as to sift out the fine curd and pick the coarser or lumpy curd into pieces, reducing the curd to the desired fineness to receive the salt evenly with very little injury to the curd and loss of "white whey."

ON THE WEIGHT AND LIMITING DIMENSIONS OF GIRDER BRIDGES.

By M. AM ENDE, Assoc. M. Inst. C.E.

THE author in this paper, which was read at the meeting of the Institution of Civil Engineers, 22nd Feb., 1881, treated of a formula for the weight of girder bridges, which he based to some extent theoretically upon the strains in the principal or primary parts, viz., the flanges, the vertical web, and the wind-bracing, and to some extent empirically, upon the experimental construction of the secondary parts or bracing. A distinction was made between the theoretical and the practical weight of girders. The former was the weight of an ideal structure, without connections and lateral stiffening; the latter contained the theoretical weight together with constants of construction for the various parts, and an item for secondary bracing in addition. The constants of construction (such as the allowances for rivet holes and cover plates) were generally understood, and there was no great variety of practice; but practice varied greatly with regard to the allowance for secondary bracing. It would be inaccurate to draw conclusions from existing structures as to that item, even for structures of equal size; but it would be entirely misleading to do the same with regard to structures of much larger size and of different proportions. The author considers it, therefore, requisite to design such structures in order to ascertain the item for secondary bracing over the whole range of practical construction. Omitting smaller structures, in which the secondary bracing was ruled by considerations apart from strict economy, this range extended from spans of 150 feet to 1,500 feet. The designs represented spans of 1,500, 1,000, 750, 500, 255 and 150 feet, the latter two having been executed for the Costa Rica State Railway. The system, common to all, was novel; and great economic advantages were claimed for it.

The principal features were:—1, a polygonal form of the top flange composed of only five straight or nearly straight members; 2. In consequence of this form few meshes in the web; 3. The depth of the girders at one-tenth and nine-tenths of the span was equal to one half the depth in the centre as characteristic of the form of the girders; 4. The depth in the centre was equal to one-fifth and one-sixth of the span; 5. The widths of the bridges were determined according to a practical formula; 6. The construction in detail was accomplished almost entirely with rolled bars, plates being used only at the junctions of the principal members. Points 1 to 3 were based upon a calculation of the theoretical weights of a number of forms of girders with a polygonal as well as with a curved top flange, the results being stated on a diagram. Point 4 was based upon results derived from the formula referred to in the latter part of the Paper. Point 5 required a formula of a curve which was an asymptote to a straight line of an assumed inclination (here 1 in 30); such a curve was a hyperbola. Point 6 was in accordance with the modern style of bridge-building.

From these designs six values for the secondary bracings were derived. If, then, the weight was hypothetically put:—

$$z'(D+z')x(B+z'')yL.$$

viz., as a function of the three principal dimensions of the structure, D the depth, B the width, and L the span, five values would be sufficient to determine the five constants. They were found to be the following:—

$$z'=0{\cdot}007,\ z''=-10;\ z'''=-6;\ x=y=\tfrac{1}{2}$$

This constituted the empirical part of the problem. Referring again to the theoretical part, a simple system had to be chosen, since a formula was required equally correct for all proportions of span to depth, besides not being too complicated. Such simple systems were the girder with two parallel flanges, and the bow-string girder with a parabola of the 2nd degree. The latter was preferred as having more points of resemblance with the girder of greatest economy than the former. The weight of the ideal structure mentioned above was determined entirely on theoretical grounds, while the necessary additions for the practical weight were derived from the designs, under the assumption that an equal degree of economy could be observed in the practical construction of the bowstring girder. The formula for the weight of the parabolic girder bridge thus completed could be utilised to ascertain not only the limiting spans of such bridges, but also a point of greater importance, viz., the most economic proportion of the depth to the span of the girders. This influence of the depth upon the weight of girders was illustrated by a diagram, which formed the record of a large number of results obtained from the formula. The author was led by it to conclusions which were in perfect harmony with experience and modern practice, viz., that for very large bridges the best proportion of depth to span was from about 1 in 4 to 1 in 5, and for small bridges 1 in 6 to 1 in 8. With a view of applying the formula to other systems, especially to the system of greatest economy, the theoretical weights of various forms of girders were calculated, and the results tabulated on the diagram before referred to. This embraced the parabolic girders of the 2nd, 3rd, 4th, 5th, and 8th degree (being necessarily all girders with many meshes in the web), and a number of girders with few meshes in the web, among which was the girder of greatest theoretical economy, and the girder illustrated in the design.

A formula was then given analogous to the formula for the common parabolic girder, but containing as a factor the proportion of the theoretical weight of any given form to that of the parabolic girder, and the practical weight could thus be calculated by referring to the table.

A diagram was exhibited showing the limiting depths of all parabolic girder-bridges, *i.e.*, the depths at which the weights were infinite; the curve defining these depths was an ellipse. The same diagram showed the depths which limited economy, *i.e.*, at which the weights were a minimum. Another diagram showed in detail the weights of the principal parts of all parabolic girder-bridges, the depths of which were most economical.

In the summary the author referred to the incompleteness of the investigations contained in the communications, and expressed his belief that a great deal more might be done in the same direction; but he thought he had succeeded in showing that the construction of a formula generally applicable to girder-bridges was not an impossibility, and that even in its present form it would be of practical use for estimating the weights of large bridges. The mathematical part required to determine the theoretical weights of flanges, web, and wind-bracing, was contained in an Appendix.

Mr. Orlando S. Emerson, of Elkhart, Ind., has patented *improvements in steam valves*. These improvements relate to puppet valves, which have heretofore been constructed with an adjustable lip, fitted for a movement by a screw ring to adjust the lip, and held in place by screw pins entering notches in the ring. In such valves the screw pins become loose or are jarred off, so that the adjustment is unreliable. The object of this invention is to avoid these difficulties. The invention consists in a spring pin in place of a screw for retaining the adjustable lip in place.

A SAFETY PAPER FOR CHEQUES.

We have to notice an unobtrusive but yet important invention, destined, unless we are greatly mistaken, to put a final stop to one of the most ingenious and formidable frauds of the present day. As the commercial world is but too well aware, a man who is supposed to be financially sound sometimes makes the disagreeable discovery that a cheque bearing his signature has been presented and paid at his bankers, the sum being much larger than that shown by the counterfoil. The banker has committed no error or oversight in the matter; the drawer's signature is indisputably authentic, but the figures and words expressing the sum have evidently been altered. For this purpose the writing must have been wholly or partly effaced and other figures or words carefully substituted. This process, difficult as it may appear, presents nothing impracticable to a man conversant with the nature of colouring matters. The inks in common use, numerous as they are, and various as is their composition, are all capable of being discharged by chemical agents, some of them of an acid and some of an alkaline nature. The knowledge of how this may be effected is not confined to upright men. A rogue may study and experiment for this end as carefully and patiently as a colour-mixer might in attempting to bring out a new discharge style in calico printing. Further, though we do not believe that any chemist of recognised eminence would knowingly give advice to any intending forger, yet it would be easy to put the question in such a manner that the applicant's purpose would never be suspected. When once the writing in the body of the cheque has been effaced, the paper is re-sized and such a sum filled in as amply repays the operator for his trouble.

It must not be supposed that bankers have made no attempts to defend themselves against this fraud. Colouring matters calculated to be affected by any agent supposed capable of discharging writing inks have been mixed with the paper pulp, and applied in various designs to the face and the reverse of the documents. Before us lies a cheque which has been filled up experimentally for the purpose of testing these supposed safeguards. The paper itself contains Prussian blue, produced by successively treating the pulp with potassium ferrocyanide and with a per-salt of iron. This tinting is intended to detect the application of any alkali which would decompose the Prussian blue and produce in the place of a blue tint a rusty yellow. On the reverse side of the cheque is a design in ultramarine, a pigment easily destroyed by acids, while on the face the name of the bank and the space to receive the writing are executed in an aniline-violet. It may perhaps surprise the non-chemical public to be told that these precautions can be overcome. Such, however, is the case. The words "eighty-seven pounds," and the figures "£87 0 0," for which sum the cheque was filled up, have been completely effaced, leaving the name of the payee and the word "Specimen," written where the signature would stand, untouched. Not only so, but the general tone of the paper, the ultramarine design, and the violet tinting on the face are unaltered. A gentleman of great experience in the tinctorial arts, and accustomed to detect the slightest difference in colours, declares on comparing the effaced cheque with one in its original condition that he could not detect any alteration.

The invention which we are endeavouring to expound, and which is due to the ingenuity of Mr. A. A. Nesbit, F.C.S., takes a point of departure at once novel, and yet as simple as the egg of Columbus. Every chemist knows that there are colours, of which litmus may be taken as a type, which are capable of being modified both by acids and by alkalies, but in a different manner. Suppose the cheque is first coloured a pale uniform greyish blue with neutral litmus. If we then print upon this with a dilute acid we shall produce red letters, lines, or devices. By a second application, of an alkaline liquid, we produce decided blue lines or devices, which may be interwoven with the former. We then fill up our cheque with any ordinary writing ink, and pay it away in perfect confidence. Let us suppose it falls into bad hands. To discharge the writing he applies, say, a dilute acid or the solution of an acid salt. Immediately the whole surface of the cheque assumes one uniform red colour and the letters, lines, and other devices disappear. Suppose he then tries to undo the mischief by the application of an alkali or the solution of an alkaline salt. At once the whole document is turned blue, and the words, &c., are not reproduced. If he applies the alkaline liquid first, the design is equally destroyed. Let us even suppose that the forger discovered some perfectly neutral liquid capable of removing writing ink. Even here he could be met by the simple contrivance of printing the design in a deeper or a paler red, produced by the application of a stronger or a weaker acid. If a design thus produced is moistened even with a neutral liquid its distinctive shades will be affected and the characters blurred. The invention further proposes to print inscriptions and marks on cheques partly by the method already described, and partly in ordinary printers' ink, "the inks being so printed that the marks or inscriptions are composed of fine lines or lettering of the dye alternating with lines or lettering of printers' ink, the printing being effected in a machine of very delicate registration." Hence, if all the coloured part of the inscription is removed from a cheque, it is practically impossible to reprint it, even with the block with which such coloured part was originally produced.

The acid which the inventor prefers is the oxalic, as it possesses the property of not corroding the plates or blocks used in printing. It forms upon the face of the plate a thin layer of insoluble oxalate, and thus prevents all further action. In the important point of cheapness, nothing can be objected to in Mr. Nesbit's process.

Judging from our present knowledge, the invention may be pronounced an easy, simple, and effectual means of overcoming a growing evil.

RECENT AMERICAN AND FOREIGN INVENTIONS.

An *improvement in underground telegraph lines* has been patented by Mr. Stephen D. Field, of New York City. The object of this invention is to prevent the accumulation of and to remove moisture from the underground tubes containing telegraph wires, and thereby insure the insulation of the wires. The invention consists in the combination with a system of underground tubes of mechanical means for maintaining a circulation of dry air, and drying or condensing chambers for relieving the air of moisture.

An *improved boat plug* which is simple, self-acting, and reliable, has been patented by Mr. Lewis H. Raymond, of New York City. The invention consists of a plate attached to the bottom of the boat over an aperture, and provided with a perforated neck, having an external thread to receive a cap on the upper side, and with a hinged valve on the bottom side, this valve being protected by a suitable cage.

An *improved baker's oven* has been patented by Mr. George Brake, of Lansing, Mich. This invention is an improvement on the baker's oven for which Letters Patent No. 215,088 were granted to the same inventor, May 6, 1879.

An *improved apparatus for balancing or adjusting the running millstone* upon its spindle has been patented by Mr. James Comerford, of Rathdrum, Ireland. This improved balance consists of a ring fixed in the eye of the stone by three or more radial set screws, and connected to the joint or other bearing on the cock head of the spindle, the ring being sufficiently smaller than the eye to admit of the stone being shifted by means of the set screws in any direction radial to the spindle, with which the ring remains concentric. The stone is supported on the ring by an inwardly projecting flange or lugs on a lining or a set of legs fixed in the eye and rising through it (more or less) toward the back of the stone, it being generally preferred that the ring should be high up in the eye, so that the bearing on the spindle may be at or above the centre of gravity of the stone, although it is not limited to this position.

Mr. James W. Pomeroy, of Boulder, Col. has patented a process of *amalgamating ores* containing gold and silver, which consists in introducing chlorine gas or chloride of lime with an acid into the pulverised ore with the mercury.

An *improved eyeglass* has been patented by Mr. Gideon C. Hilpert of Hill, N.H. The object of this invention is to provide eyeglasses that are adjustable upon the nose in a straight horizontal line, instead of with the rolling motion common with other eyeglasses. The improvement consists in lenses connected with each other by means of a straight rod, and adjustable with respect to each other by means of a spiral spring encircling the rod.

A device for *preventing the lateral vibration of a circular saw* while running, has been patented by Mr. Clarence A. Sherman, of Plover, Wis. The invention consists of a pair of laterally adjustable guide arms and guides fixed on an adjustable bar that passes laterally through a centrally mortised sliding block, which, together with its attachments, are held in place by means of a cam-operated bar.

Mr. Jacob R. Scott, of Nyack, N.Y. has patented a machine for *sewing boots and shoes* that will meet the requirements of that class of work without complicated mechanism; and the invention consists specially in the mechanism for tightening the stitch whereby the layers of leather are tightly drawn together, and also in the looping mechanism for forming the stitch.

A machine for *grinding mower and reaper knives* has been patented by Mr. Charles Askew, of Madison, Wis. The invention consists in a novel rest and carrier for the sickle bar and combination and arrangement thereof with relation to the grindstone, whereby provision is made for adjusting the sickle bar to the grinding surface.

Messrs. Leonard A. Cooper and Oliver E. Bostwick of Atchison, Kan., have patented a combined *listing plough and seed planter*, so constructed as to open a ridge or clear a space for the row of hills, open a furrow to receive the seed, drop the seed, cover the seed, and roll down the soil. It is simple, and readily adjusted and controlled.

An *improved injector and condenser* has been patented by Mr. Gaspare Mazza, of Turin, Italy. The invention consists in combining a boiler pipe, cones, and connected eccentrics having different throws with a feed water pipe and a steam inlet having a cock.

An *improved steam engine governor* has been patented by Mr. Walter E. Crane, of Alma City, Minn. The object of this invention is to dispense with all devices depending on centrifugal action, or the force of gravity for their operation in the regulation of speed is obtained by the variations in speed between mechanism operated by the engine, and mechanism moved by a separate motor at a regulated speed.

An improvement in *ironing tables* that can be folded compactly together when not in use, so that it may be placed out of the way has been patented by Mr. William G. Lindsay, of Winnebago, Wis. The invention consists in hingeing or pivoting the ironing board to the end of one of a double pair of hinged or pivoted cross legs, and securing to the underside of the board a ratchet-toothed spring-bar, upon which the round of the other pair of cross legs may be placed at any required distance apart, by which means the height of the table may be adjusted.

A *hook for reels* to fishing rods which is simple and effective has been patented by Mr. Henry Prichard, of New York City. The invention consists of a sleeve surrounding the fishing rod, and provided with a notched internal shoulder at its upper edge, which engages with one of a series of studs on the metal casing of the rod. If the sleeve is passed down over the upper end of the plate or slip of metal to which the reel is attached, the lower end of which is passed into a suitable socket, the plate can be firmly locked in the desired position by turning the sleeve.

Mr. Henry O. Koschwitz, of Brooklyn, E. D., N. Y., has patented a method of making *buttons* and similar articles, consisting in turning the articles in a lathe first in one direction and then in a direction at right angles to the first, and then splitting or cutting the cylinder with rounded ends thus obtained longitudinally into several pieces, which are ground or planed and polished.

Mr. Thomas Leach, of Taunton, Mass. has patented an improvement in *baking dishes*, applicable to all kinds of covered dishes, such as pickle casters, jewel cases, sugar or butter dishes, &c. The dish has novel means for maintaining the cover of the dish in suspended position above the receptacle.

A *draught equaliser* which is simple, strong, and durable, and can be easily adjusted according to the strength of the animals and the resistance of the load has been patented by Mr. Franklin H. Standefer, of Fort Payne, Ala. It consists in a doubletree provided with a vertical longitudinal slot, and made adjustable lengthwise on the doubletree bolt by means of a screw.

An improved *hinge for folding bedsteads* has been patented by Mr. Hermann A. J. Heckert, of New York City. This invention relates to hinges for folding bedsteads wherein the bedstead is fitted for being turned into a cabinet. The object is to furnish a hinge which will permit ready removal of the bed from the stand without unscrewing the stand, and this invention consists in a hinge having its leaves formed separate, one being made with the hinge pin as part of the leaf, and the other leaf made with a semicircular recess for the pin.

An *adjuster for the slats of window and door blinds*, so constructed that the slats can be adjusted into any desired position and will be securely held in place has been patented by John H. Monk, of Brooklyn, E. D., N. Y.

An improved *bag tie* has been patented by Mr. Lewis A. Fish, of Faribault, Minn. The invention consists of a double-eyed double hook, whose hooked end is formed by bending the end up at right angles to the shank, then along the shank of the hook and parallel therewith, then upward again at right angles, and finally back on itself and parallel with the shank, and whose eyes are formed on the other end of the shank by loops extending laterally on either side.

A method of producing distinct and artistic *patterns on pearl buttons* has been patented by Mr. Charles L. Woodbridge, of Brooklyn, N. Y. The invention consists in first painting or sizing the surface of the button with some substance not soluble in a nitrate of silver solution, the pattern that is to be produced; then a solution of nitrate of silver is applied to the whole surface of the button, and the button then exposed to the light. The actinic effect of the light soon changes the colour of the nitrate of silver either to a light brown or to a darker colour, according to the duration of the exposure and strength of the solution. Then the paint or size is washed off with spirits of turpentine or other resolvent, and the design is thus left clear and distinct in the natural colour of the button on the face of the button, after which the design may be further wrought out by engraving and gilding.

Mr. Lucius S. Edelblute, of Cincinnati, O., has patented an improvement in the class of *thill couplings* or shackles in which the thill irons are adapted to be detached from the axle clips when raised to a vertical position.

A vehicle *spring*, patented by Mr. Fred Schelp, junior, of Baldwin, Mo., consists in the combination with the sidebars and cross-springs of a sidebar wagon of a median longitudinal spring passing under the front and rear axles, and connected with the body by stay-rods, whereby a more elastic, easier running, and strong spring gear is secured.

An improvement in *well boring* apparatus has been patented by Mr. Edgar P. Watrous, of Moravia, N. Y. The invention relates to wells which are formed by sinking metal tubes. The tube is provided with a cutting edge at the lower extremity, and is made to penetrate the earth by rotation on its vertical axis, being fed to its work by means of a screw-feeding arrangement. The rotation is accomplished by a hollow crank joined to the top of a tube section through which water is forced, the water being discharged from the upper part of the tube section, to which is attached a small chamber and spout.

A *speaking-tube*, mouth-piece, and bell-lever has been patented by Mr. William R. Ostrander, of New York City. Speaking-tubes and bell-levers for operating wires are combined in one apparatus, which effects economy in construction and convenience in use. The bell-lever is pivoted on the mouth-piece, and both are secured to the wall by a single attachment.

Mr. John Menahan, of New York City, has patented a *pocketbook fastening*, which is so constructed as to hold the pocketbook securely closed. It consists in a plate having one or more holes to receive the fastening pin and flanges upon its side edges to receive a sliding plate having one or more holes to receive the fastening pin and slots between its holes to receive the neck of the fastening pin.

A safety attachment for watches has been patented by Mr. James Roberts, of Brooklyn, N. Y. A plate or ring, having scalloped edges, is slipped over the stem of the watch, projecting horizontally, and so nearly filling the pocket that when a thief attempts to extract the watch the projecting plate will catch in the lining of the pocket and alarm the owner. Or if the thief attempts to take hold of the plate itself, the pressure of his fingers in the narrow space between the plate and the pocket will alarm the owner.

A double try-square, patented by Mr. William Hoffmeister, of Mossy Creek, Tenn., Two ordinary try-squares are joined together side by side, a suitable and adjustable distance apart, by a metal plate and screws or equivalent means, by which means the square may be made to straddle boards of different thicknesses. The scope of the tool is by this means much increased, and kinds of work performed with it which are not possible with the ordinary try-square.

Eyeglasses.—Mr. Francis Hopkins, of New York city, has patented an improvement in eyeglasses, the object of which is to obtain a firmer grip upon the nose without tightening the spring, to prevent the glasses from slipping forward on the nose, and to hold them on the nose nearer to and on the same plane with the eyes. This is accomplished by forward projecting arms to which the spring is attached.

Buildings.—Mr. William H. Older, of Packwaukee, Wis., has patented an improved construction of buildings designed especially for barns upon prairies and other parts of of the country where timber is scarce. A peculiarly constructed frame of timber and wire, the timbers being secured by bolts, is the principal feature of the invention. The outside may be covered with straw thatch, tarred paper, etc. A serviceable building can thus be constructed with little timber and at a small cost.

A thill coupling, patented by Mr. Levi R. Stuart, of Seymour, Conn., has a grooved cushion and centrally grooved plate claimed to provide a more durable and more easily adjustable spring to prevent rattling of shafts on their bolts than has hitherto been supplied.

An Improved Account-book.—Mr. Edwin R. Hutchinson, of Detroit, Mich., has patented an improved account-book, which saves time and work in making up trial-balances from a ledger. The book is bound with half leaves that are ruled for an index, and fitted with a removable pad provided with leaves ruled in columns for account totals, arranged for two or more balances which pad when in place forms, with the bound half leaves, a complete trial-balance book, into which the headings or names can be copied on the bound portion and the accounts carried out upon the pad leaves for two or more balances, and the pad renewed by another when exhausted, all with but one entry of the names or headings.

Wheat-heater for Flour-mills.—Mr. Ura H. Palmer, of Elizaville, Ky., has patented a heater in which the grain is heated by the direct contact of hot air, the air being heated by the direct contact of hot air, the air being heated by a lamp and circulated in currents through perforated tubes, among which the grain passes by virtue of its own gravity.

Three-wheeled Vehicle.—Mr. Prosper Humbert, of Austin, Texas, has patented a vehicle which has one or more seats so arranged that the forward seat turns with the horses so that the driver is always directly in the rear of the horses, and holds the reins at the same length no matter how much the horses may turn to either side.

A Feed-water Heater for Steam Engine Boilers.—Mr. George B. Taylor, of New Brunswick, N. J. The heating chamber is formed of two plates attached to a frame, and its interior is divided into zigzag form by strips extending alternately from the to the bottom, and from the bottom to the top. The heating is accomplished by the products of combustion as they pass through the smoke box.

Cultivator.—Mr. Charles Niederauer, of La Grange, Texas, has patented a cultivator in which the standards may be adjusted to regulate the depth of the cultivators or ploughs to avoid obstructions. Each cultivator or plough standard has attached to it an adjustable segment, and the standards are all operated together by a lever and link connections. The ploughs are thus raised, while the main frame upon which the operator rides is not raised.

Reapers and Mowers.—Mr. Gottlieb Kinsey, of Lock Seventeen, Ohio, has patented an attachment for reapers and mowers which is a substitute for ordinary reel, and which, while less expensive, is claimed to be equally as effective. It consists substantially in a rake which is automatically raised swung forward, lowered, and drawn back as the machine advances to draw the grain or grass against the cutter bar.

Wind-wheel.—Mr. Jacob Gilstrap, of La Plata, Mo., has patented a wheel of that class in which the access of wind is controlled by hinged valves regulated by the action of a governor. Instead of two cords and rings for connecting each valve to the governor Mr. Gilstrap uses only one cord to operate the valve in one direction, its movement in the other direction being controlled by a spring. By this means the number of parts is greatly lessened and a consequent reduction in friction results.

A Vehicle Spring.—Mr. Seymour Van

Nostrand, of Stormville, N, Y., has patented a spring claimed to be of superior elasticity and strength, and having the important feature that by ingenious devices the elasticity of the spring can be increased or diminished at will to suit different loads.

Dye and Bleach Vat.—Mr. James Smith, of Thornliebank, county of Renfrew, North Britain, has patented a dye and bleach vat more especially designed for the series of processes known in calico printing as dunging or treatment with dung substitute, but which is also applicable to bleaching and dyeing processes, &c. The apparatus is claimed to be far more convenient and compact than that heretofore used.

Tanning Hides and Skins.—Mr. Heinrich Trenk, of Berlin, Germany. Two solutions are employed, mixing in the proportion of two of the first to one of the second. The first solution is composed of 25 parts pyroligneous acid, 25 parts chromate of alumina, in 1000 parts of water. The second is a concentrated solution of crude tartar and a small quantity of chloride of zinc or analogous salt.

Mast.—Mr. John McLeod, of Auckland, New Zealand, has invented a self-adjusting mast which is intended to increase the safety and improve the sailing qualities of boats and vessels. The mast is hung on trunnions on a thwart of a boat or beams of a larger vessel, and its foot rests on a curved tube with strong springs coiled around it. A counterbalance is secured about the foot of the mast to increase the inertia and to operate as self-adjusting ballast, and strong springs are also attached to the shrouds to assist in holding the mast in an upright position.

A pocket register for recording one's daily expenses has been patented by Mr. Frederick Horn, of St. Louis, Mo. Two small disks are marked with numerals on their outer faces, placed back to back and united at their edges for about three-quarters of their circumference. A movable disk may be held fixed by a spring, has numbers, lines, and indentations on and about its edge, and is inserted on a pivot between the fixed disks. By turning the movable disk the amounts of separate expenditures are added to those previously recorded.

A root cutter, for cutting roots of trees, patented by Mr. Thomas Davies, of Fall River, Mass., may be used for the cutting of roots in felling trees without dulling the cutters, for cutting limbs from fallen trees, for splitting wood, and other purposes.

A water indicator for boilers, patented by Mr. John Bridges, of Leon, Iowa, consists of an arrangement of float pipes, levers, and an indicator, which operate in combination with a water supply tank, feed pump, and boiler for automatically regulating the height of water in the boiler and indicating the water level.

Fruit-gathering.—Mr. Louis D. Clairoux, of Detroit, Mich., has patented a fruit-gathering apparatus, which consists in a novel construction, arrangement, and combination of a framework, apron, trough, and other devices, which provide for readily applying the apparatus to a tree and adjusting it to different positions. The fruit is received upon the yielding surface of the flexible apron, and, rolling to the centre, passes into a trough, which conveys it, without bruising, to the ground.

Apparatus for *retailing nails, nuts,* and other articles sold by the pound and which facilitates the handling of such goods in getting them out and weighing them, has been patented by Messrs. Henry C. Draper and Thomas Bowyer, of Oswego, Kansas. The receptacles which hold the articles are hung on trunnions in a novel sort of frame, so that they can be turned down into a horizontal position for the more effective employment of the scoop or other implement used to take them out.

Extracting Cartridge Shells.—James F. Marvin, of Fort McDowell, Arizona Territory, provides a means whereby, when the heads are pulled off of cartridges, the shells may be easily extracted. A slotted expanding tube, with flanges and shoulders, and an expanding pin, is inserted into the shell. The closing of the breech expands the device into engagement with the metal of the shell, and when the breech is again opened the whole is extracted together.

An improved lock, patented by Mr. Joseph Sirnguey, of New Orleans, La., is so constructed that its keyhole may be adjusted to any desired position, thus adapting the lock to be attached to doors having key holes from former locks. The casing of the lock is provided with sliding plates in which are the keyholes, and which may be fastened permanently with screws when adjusted to the desired position. By employing two sets of plates, one of which has a barrel for a spindle-key and the other a spindle for a barrel-key, the lock may be fitted for use with any kind of key.

Millstone.—Mr. George F. Letellier, of Tye River Depot, Va., has invented an improved millstone dressing machine of that class which employs a pick, and may be adjusted to act from the eye to the skirt of the stone. The invention consists in improved means for tripping the pick lever for regulating the force of the blow, and for adjusting the pick over the face of the stone to any required position.

Rotary Engine.—Mr. George W. Dudley, of Waynesborough, Va., has patented a rotary engine which dispenses with valves, sliding abutments, &c., operated from the driving shaft by means of cams, eccentrics, &c. Segmental pistons are employed and a novel reversing valve is provided.

Switch.—Mr. William R. Fearn, of Savannah, Ga., has patented a railroad switch which places the control of switches in the hands of the engineers or train men. The switch levers are connected to a rod extending in both directions from the switch, and fitted with crank levers extending between the tracks. These levers are operated by a swinging block or key hinged to the lower end of a hanger that depends from the car or locomotive platform, and which is actuated by a lever and rod to switch the cars from one track to another as required.

Scythe Snaths.—Mr. John Gearon, of Beloit, Ia., has invented an improvement in scythe snaths, which consists in a scythe snath formed in three parts, halved to each other, secured at their junctions by bolts, and provided with handles. By this construction the parts are rendered adjustable to suit the convenience of the operator, and the proper position of the scythe relative to the handles is secured without the usual bending in the manufacture of the snath when formed in a single piece.

Inkstand and Calendar.—Mr. J. B. King, of St. Paul, Minn., has patented a calendar inkstand, which is simple in construction, and serves as a perpetual calendar. The inkstand has the numerals of the days of the month arranged in a table at the front, whereas the names of the days of the week and of the months are arranged on the outer surfaces of two cylindrical ink-wells fitted into corresponding chambers of the stand, each chamber being provided with a vertical slot in front, through which these names may be read.

Check Receiver.—Mr. John Casey, of Jersey City, N. J., has patented a check receiver for use in restaurants, bar-rooms, and other places to receive checks handed in by customers. It not only exposes to view all the checks inserted, but also exposes in a series a certain number of checks last received, before they finally enter the receiver, whereby if a wrong check be inserted the error or fraud may be detected.

Improved Bolt.—Mr. Andrew Climic, of Ann Arbor, Mich., has patented an improved bolt for the locks of cases and drawers in museums, &c., where a number of doors or drawers are required to be locked at the same time. He employs a series of bolts with sockets upon the sides of their bases, a series of bearings, one or more sliding rods carrying the bolts, one or more bent levers, and one or more connecting rods, by which mechanism one or more series of bolts can be simultaneously operated.

Signalling.—Mr. Horatio Ely, Jr., of Red Bank, N.J., has patented a railroad signalling apparatus, which consists of series of self-adjusting rocking bars secured below the rails parallel to the cross-ties, provided with arms projecting upward on the outside of the rails in position to be struck by advancing trains. Motion is communicated by wires or rods connected with the rocking bars to signals or guards in advance of the trains.

Messrs. Anthony W. Byers and James C. Dorser, of Sherman, Texas, have patented an *improved cotton planter* so constructed that more or less seed can be planted as desired. A slotted hopper having a slotted feed-board controlled by springs, and a spiked feed-wheel supplied with prongs and curved plates, are the principal devices employed to accomplish the end sought, these devices being adjustable.

Car Coupling.—Mr. Jasper N. Blair, of Slippery Rock, Pa., has patented a car-coupling consisting of a drawbar containing two longitudinally hinged spring-actuated dogs set a little apart with their sloping faces presented towards each other, thereby forming a central wedge-shaped opening into which the coupling link can be entered, caught, and held by the shoulders at the rear of the dogs. A segmental lever is employed for throwing the dogs apart in uncoupling the cars.

Grass-cutter.—Mr. Luther Homes, of New Orleans, La., has patented a grass-cutter so constructed as to cut the grass without any vibration or rotation of the knives as the machine is drawn forward, and which permits the knives to be readily detached and sharpened. The knives are constructed to yield to any undue obstruction. Short knives are arranged in oblique angular relation with two long knives, and the grass to be cut being drawn into the angles formed by the edges of the blades, is cut by the forward movement of the machine.

Mr. George Oliver, of London, has patented *improvements in the apparatus for use in theatrical performances*, for which two applications for Letters Patent in the United States were filed by the same inventor on the 19th day of June, 1880. The invention consists in the combination with the strings and the wire by which the performer is raised, of a erum and brake interposed between the springs and the wire for the purpose of taking up the slack of the wire after the performer has received an upward impetus from the springs, and of retaining the performer at any height to which he may be may be raised, and checking his descent.

ACTION OF DRY CARBONIC ACID UPON QUICKLIME.—M. F. M. Raoult finds that a fragment of dry quicklime, heated to about the melting-point of glass and exposed to a current of pure dry carbonic acid, absorbs the gas with great energy, becoming incandescent. It is necessary that the lime should not contain more than from 2 to 3 per cent of foreign matter, and that it should not have been burnt at too high a temperature. The compound produced is a bibasic calcium carbonate. It is practically impossible to produce the neutral carbonate by direct synthesis. If lime has been burnt at temperatures exceeding 1100° it absorbs carbonic acid very slowly, and appears as if its molecules had been condensed and in some sort polymerised by the heat.—*Comptes Rendus.*